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CENTRAL INTELLIGENCE AGENCY

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CHINA/EAST GERMANY

Economic

Co-operation between the DDR and China

in the construction of Power Stations

Development of Power Supply in the Chinese People's Republic since 1957

1. The present period of reconstruction of the power supply in the Chinese People's Republic (2nd 5-year plan, 1958 - 1962), following the great forward movement since 1958, is being more and more expanded according to the LENIN formula that:-

"Electrification of the whole country plus Soviet Power = Communism".

The results of this great progressive movement demonstrate the tremendous rate at which the build-up of the power supply in the Chinese People's Republic is proceeding. The development of the generation of current and the investment figures are shown as follows:-

Plan Year	Total Increase MW	Steam MW	Water MW	Import quota (Steam) MW	Current generation million KW/hrs
1st 5-year plan					
1953-1957	2167	1567	600	1238	----
1957	666	591	75	530	19,300
2nd 5-year plan					
1958	1796	1598	198	768	27,500
1959	3190	2740	450	1086	41,900
1960	4590	3470	1120	1621	----

1959 Structure of plan fulfillment and 1960 preliminary planning

For thermal power stations, plan fulfillment in 1959 is 2740 MW
preliminary planning for 1960 is 3470 MW
to be supplied as follows:-

From 6 MW - 100 MW

Country	1959 MW	1959 Units		1960 MW	1960 Units
USSR	1124.5	26		925	14
CSR	124	4		396	15
DDR	74	4		250	5
HUNGARY	75	3	POLAND	50	5
CHINESE People's Republic	1096	91		1849	?
	2493.5	128			
under 6 MW	247.4			-----	
Total MW	2740.9			3470	

The DDR quota for the 1960 Plan is as follows:

[redacted]

LIAU NING Power Station	4 units of 50 MW	=	200 MW
TSIN HO Power Station	1 unit of 50 MW	=	50 MW
Minor power stations		=	39 MW
		=	289 MW

Quota of Deliveries by the DDR for the Period 1958 - 1962

2. Apart from the main deliveries of turbines and complete steam generators, deliveries of measuring and control apparatus, high-pressure and medium-pressure pipelines, feed pumps, protective installations for generators, coal pulverizing plant, and heat circulators were also made to the auxiliary plants.

(a) In the period 1956 - 1962 the following were delivered and/or are intended for delivery:

For medium and large plants in toto:

932.90 MW in 28 units of 8, 12, 12.5, 25 and 50 MW output.
5770 t/h in 44 units of 50, 75, 200 and 220 t/h output.

For minor power stations in toto:

119.4 MW in 64 units of 1.5 and 3.2 MW output.
790 t/h in 87 units of 5,10 and 20 t/h output.

The following numbers of boilers and turbines have been and/or are to be put into service:-

Medium and large plants:

	1957	1958	1959	1960	1961	1962
Turbines, Nos/MW	9/102	3/37	4/74	5/250	4/200	3/150
Boilers, Nos/t/h	12/650	5/375	9/750	8/1355	4/800	6/1200

Minor Power Stations

Turbines, Nos/MW	4/6	3/37	--	20/30	20/38.5	17/28.9
Boilers, Nos/t/h	8/40	22/110	--	30/200	20/150	7/140

(b) Position of Plan tasks in 1960

In the power programme for 1959 the deliveries from the DDR amounted to 75 MW divided as follows:-

TAIYUAN 2 turbines of 12.5 MW and 5 boiler plants each of 75 t/h

POUTING 1 turbine of 25 MW and 1 boiler plant of 200 t/h. 1st DDR high-pressure steam generator in the Chinese People's Republic.

1 turbine of 25 MW which was not only installed in 20 days but also increased to 3000^{n-1}.

LIAU NING 1 turbine of 50 MW, assembly completed - starting up follows on arrival of inductor.

(c) During the 1960 Plan Year

At TAIYUAN the 6th boiler will be set in operation in January, and except for connecting the gas furnace and the bleeder regulator, the station will be completed.

.../...

At POUTING two 25 MW turbines and the 1st high-pressure steam generator will be in continuous operation by the end of January 1960.
The 2nd steam generator of 200 t/h will be in operation by the end of March.
The 3rd steam generator of 200 t/h is at present in storage. The date of its erection has not yet been announced.

At LIAU NING A large-scale power station is being built by international co-operation.

5 x 50 MW units from the CSR.
2 x 50 MW units from the USSR.
2 x 50 MW units from the Chinese People's Republic.
4 x 50 MW units from the DDR.

The units from the USSR and the Chinese People's Republic are being brought into operation and at the moment 3 units are operating at partial load.
The plan for putting the German plants into operation is as follows:-

1st turbine by cross connection in January 1960
2nd turbine at the end of March 1960
1st boiler plant at the end of March 1960
2nd boiler plant in June 1960
3rd unit at the end of the third quarter of 1960
4th unit in the fourth quarter of 1960

At TSIN HO with 8 x 50 MW turbines and 10 x 200 t/h steam generators, assembly begins in the 3rd quarter of 1960.
Due to 3 orders, construction takes place in 2 stages:

Operation of unit 1 - by end of 1960
Operation of units 2 - 4 - by end of 1961
Operation of units 5 - 10 - by end of 1962

Minor power station plants During the first half of 1960, the plans for construction projects and instruction manuals will be worked out in PEKING with the help of six experts.

(d) The Preliminary Plan for the Delivery Period 1963 - 1965, namely:-

	Turbines		Steam Generators	
	Nos.	MW	Nos.	t/h
1963	2	100	2	350
	2	50	2	200
1964	2	100	2	350
	2	50	2	200
1965	6	50	6	200

has been shelved and the new requirements have not yet been made known [redacted]. 50X1-HUM
Agreement from the Chinese side is not possible before the first quarter of 1960, since the Minister for Power has announced that the Plan figures will not be published by the Council of State until then.

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The Position and Development of the Power Machine Building Industry in the Chinese People's Republic

3. The persistently huge demand for current could only be satisfied by a rapid rise in home production of large installations, together with a swift approximation to world standards of engineering. This vital section of the economy had always been given a great deal of attention by the Chinese Communist Party and by the government. In the course of time, HARBIN and SHANGHAI have grown into two main centres of production of the power machine building industry. Production has reached the following stage and/or provides for the following development:

HARBIN In series production based on Soviet models:-

25 MW turbine assemblies with 160 t/h steam generators
50 MW turbine assemblies with 250 t/h steam generators

SHANGHAI 6 and 12 MW units of CSR design
25 and 50 MW units of own design

Due to lack of alloyed steels the high pressure plants are temporarily being built for only 500°C. The generators of the 50 MW units are intended for H_2cooling, but are in fact cooled with H_2O. Of the existing 30 production types, only the 6, 12, 25 and 50 MW types are at the moment being produced in series.

In the process of development are 100, 150, and 200 MW, complete block units. The production of the first 100 MW block is scheduled for 1961/62. Some special features of the investment in power equipment should be mentioned:-

1959 the first home-produced 50 MW block units were set in operation
1959 in PEKING and FUSHIN the first 100 MW block units supplied by the USSR were set in operation
1959 the index figures for the 2nd 5-year plan were reached 3 years ahead of time for such important industrial items as steel, coal, machine-tools and grain
1960 the first 50 MW block units from the DDR will be set in operation at the LIAU NING power station
1960 the first sod will be turned for the construction at JAN POSHAN, Inner Mongolia, of a large power station of 10 x 200 MW turbines supplied by the USSR (total output 2,000 MW)
1960 the first hydro electric power projects with a total output of more than 1,000 MW will come into action.

Import Requirements of the Chinese People's Republic during the 2nd 5-year Plan to 1962 and during the 3rd 5-year plan 1963-1967

4. By 1958 provision had already been made for a very great increase in home production of the main installations such as turbine generators and steam generators. However no productive effects were achieved, because it was impossible to overcome bottlenecks in the provision of ancillary equipment such as local and high-tension current installations, metering and control equipment, as well as of tubing and heat circulators.

At a conference in December 1959 with Comrade LIU, Minister for W. & E. (?Wasser u. Energie - Water and Power) it was stated that until 1962 great efforts would still have to be made in order to supply their own main installations with the requisite ancillary equipment, and for this it would be necessary to draw upon imports as well.

1963 - 1967 (during the 3rd 5-year plan) power producing plant will continue to be imported from friendly countries, such as the DDR. These

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[redacted]

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imports will consist of complete plants for thermal and hydro-electric power stations as well as the supply of ancillary plant and transmission installations.

The following gives some indication of typical Chinese import requirements of power station equipment:

(a) Complete plants from 50 MW upwards, with minor reservations regarding ancillary installations such as coaling plant, main cooling water supply, and chemical water-preparation plant.

(b) Additional supplies of electrical equipment for own use and for high tension plant of 55, 110 and 220 MW, measuring and control plants, high and medium pressure tubing complete with joints and welding equipment.

(c) Construction and rigging implements, such as special implements for starting the erecting work and for general maintenance work, modern building and transport machinery such as heavy-load lifting devices (railway), lorries and caterpillar tractors.

(d) Small permanent and mobile power stations, the permanent ones being of 6 MW.

(e) Gas turbines of all sizes. CSR deliveries of small transportable gas turbines start in 1960.

(f) Insulators and conductor cables for transmission installations of all voltages up to 380 KV.

(g) Equipment for transformer works and local distributing stations.

Suggestions for the Structural and qualitative improvement of exported goods

5. (a) Performance quality of plants in operation:

All the medium size power station installations put into operation during 1957/58, namely:-

14 turbines of 8. 12 and 12.5 MW
20 steam generators of 50 and 75 t/h

have been operated at continuous excessive load for more than a year,

for instance:-

Power Station I CHEN CHOW 2 turbines each of 12.5 MW at 16 MW
Power Station III SHI SHE SHAN 2 turbines each of 12 MW at 15 MW
Power Station V CANTON 1 turbine of 12.5 MW at 16 MW
the 50 t/h steam generators with travelling grates at 70 t/h
75 t/h pulverized fuel boiler at 80-90 t/h

(b) Locally executed alterations for improving efficiency:

All the steam generators supplied by VEB DAMPFKESSELBAU, HOHENTHURM, had to have the headers of the furnace tubing cut into 3 parts and defective workshop welding on the waste steam pipes and the economiser coils rewelded in order to improve the water circulation. On nearly all the 75 t/h and 50 t/h steam generators delivered, the super-heater area had to be reduced by up to 50%.

These units consisted of:-

9 each of 75 t/h for power stations II, VII and TAIYUAN 50X1-HUM
3 each of 200 t/h for power station POUTING.

[redacted]

(c) Technical clarification of questions regarding increased reliability in service. The most important engineering problems at present being dealt with are:

CANTON Power Station

(i) Ascertaining why cracks have appeared, and continue to appear, in the boiler drums during operation. Supplying firm: VEB DAMPFKESSELBAU, MEERANE.

(ii) Increasing the draught velocity of the forced draught apparatus by improving the fans.

(iii) Finding out why the motors driving the fans fuse.

All pulverised fuel boilers

(i) Attaining longer periods of operation by improving the method of firing.

(ii) Improving the extraction of salt deposits from the boiler drums.

LIAU NING Power Station

Technically safeguarding the satisfactory running of the inductors.

Large steam generators of 200 t/h capacity and over

Guaranteeing the pulverised coal output of the tube mills, dependent on the high moisture content.

Preliminary Trials of the crushers being installed for the first time in the course of the second extension of the TSIN HO Power Station, as a new method of economising on capital and working costs. The crushers are intended for the 3 small boilers of 20 t/h capacity each, which are being supplied by the DDR.

(d) Hints on improvements in construction and quality

Attention must be paid to the following improvements on the 50 and 100 MW block-units which are to be delivered between 1961 - 1965 and later:

Steam Generators

(i) Introduction of the light construction method by using the refractory fireclay and foamed-concrete process for the boiler masonry.

(ii) Perfecting the block-construction method.

(iii) Improving salt extraction from the drums.

(iv) Utilisation of coal ignition firing (Kohle-Zuendfeuerung - ?Turbulent burners) which is being introduced for the first time in China.

(v) Defining the climatic conditions under which a semi or partly open air type of building can be used.

(vi) Introduction of welded connections on the high-pressure feed pipes.

[redacted]

Generators

(i) Adoption of H_2 cooling for the generators.

(ii) The technical solution of uniform distribution of heat in the generators when in operation.

(iii) Improvement and utilisation of reliable and foolproof materials in the manufacture of dynamos and insulations.

(iv) Investigation and elimination of the occurrence of stray currents.

(v) Standard types of generator protective (or safety) equipment.

Measuring and control installations

(i) Definite agreement on the requirements of measuring and control points, in order to simplify medium and small plants.

(ii) Standardisation of the engineering of the block maintenance points and of the central control stations of large power stations.

Miscellaneous Suggestions

(i) Use of equipment resistant to tropical conditions in localities where the climate does in fact necessitate it.

(ii) Perfecting the engineering of single pieces of equipment and of plants, in order to achieve greater reliability in service.

(iii) Better supervision of the quality of single parts and of co-ordination within the whole project.

(iv) Better supervision of the assembly engineering and setting in operation.

(v) Co-ordination of transport of unwieldy pieces of equipment in order to save space.

(vi) Utilisation of automatic electric fuses.

Concerning Supplies

(i) Integrating the delivery dates of the auxiliary installations to those of the main plants.

(ii) Operational assistance in the event of unexpected delay in delivery by means of technical resources or suggestions.

(iii) Co-ordinating times of delivery of spare parts with shipments of assemblies.

(iv) Improvement and despatch in advance of a comprehensive manual of methods of storage.

(v) Provision of technical utensils for the designing offices.

(vi) Introduction of servicing for plants in operation, with the object of supplying extra materials and special parts which are subject to rapid wear and tear.

(vii) Agreement on the significant technical factors, especially those for coal fired steam generators.

Small Power Plants

(i) Fundamental redesigning of the project, aiming at producing simpler and more robust standardised units, since these plants are mostly erected in the remoter regional areas to help open them up, or on the People's Communes.

(ii) To ensure a constant current supply in small industrial power plants the use of bled condensation turbines are preferable.

(iii) Replanning the lay-out of the oil containers, bearing in mind the replacement of condenser tubes.

Ascertainment of Products needed in the Chinese People's Republic

6. All products required in the power plant sector have been mentioned in the report. [redacted] the CSR is employing a large group of experts on designing extensive projects for the basic chemical industry in FUSHUN and DATUNG. 50X1-HUM

High Capacity hydro-electric plants

Possible co-operation by supplying generators from the VEB SACHSENWERK should be examined.

Conditions in which goods exported by the DDR are delivered, unloaded, transported, and installed

7. (a) Packing

(i) No damage worth mentioning has been caused by bad packing. Only in the case of rotating machine parts fitted up before despatch was damage caused to the roller bearing by the jolting and jarring from the long railway journey.

(ii) The iron cross ties used as bracing for nests of boiler tubes must be shored with wood during transport by rail.

(iii) The package of the special apparatus in "Igelit" (type of plastic insulation) wrappings has proved very successful.

(iv) In spite of extensive insulation of the parcels with roofing felt, there was evidence of penetration by rain water.

(v) A saving in wood could be made in the case of the repeater-station test-desks boarded up in tongued and grooved boarding from GRW TELTOW.

(b) Unloading and Storage

(i) Unloading from railway wagons of large power plant is done mostly with modern lifting gear. Transport of about half

of the small power plants from the collecting centre to the local sites is by sledge, sometimes several hundreds of kilometres over roadless country.

(ii) On arrival, the medium and large sized plants are apparently inspected for damage. The removal from storage usually begins only in the presence of experts. Full regard for proper care and maintenance of the installations commences only after hand-over to the user.

(c) Assembly of the Equipment

(i) The dismantling of the instruments, fittings and other delicate components is carried out according to Russian methods of verification, and the competence of the individual.

(ii) It is always stated that all DDR plant is certified works' tested. Special precision instruments are supplied with lead seals to ensure guaranteed performance.

(iii) It is important to provide a comprehensive and well arranged manual of storage technology.

(iv) All parcels must be labelled clearly on the outside.

Publication of Scientific Literature in the Press

8. The Ministry of Water and Power Economy has its own publishing house, which, among other things, regularly issues technical and scientific periodicals. All international literature from socialist as well as capitalist foreign countries, including factory newspapers, is comprehensively evaluated. Each economic functionary and leading cadre is obliged to hand in every year a written contribution on some economic or technical subject. From the German side the following have been reported in the Ministry's technical journal:

"Water circulation tests and improvement of salt extraction on the 75 t/h steam generators in power station II".

Also the lectures on welding given by colleagues STIER of the DDR Trade Mission and SCHMIDT of the ZML, in which the most important matters dealt with were questions of metallurgical treatment and the chemical analysis of materials. Political reports appear constantly in provincial and local papers in relation to the progress of the building being done, and pointing out the great help being given by the DDR in building up these power stations.

(a) Complaints of quality and engineering and economic problems arising therefrom

The only complaints made at the instigation of the German experts were over smaller components not replaceable locally. Elimination of functional breakdowns which have to be put right under guarantee of performance, are dealt with by direct consultation on the building sites. In special difficulties the supplying firms in the DDR are occasionally called on for technical advice. It is most important that there should be swift practical co-operation from the supplying firms, without the need for previous legal decision on contractual rights. Tests for engineering efficiency have not yet been conducted by the Chinese, nor have they been requested by the Germans.

Specialists

10. The employment of experts abroad to guarantee a high professional and political standard should be ensured by means of centralised engagement by the competent VVB or the higher authorities of the works. The service of the experts should not be bound to the project, but should be professionally valid for all projects for the term of employment. The professional qualifications of the experts should be wider.

Turbine Specialists:	Fitting, putting into operation, and if necessary control or regulation.
Boiler Specialists:	Assembly of all plant necessary for a complete boiler assembly, welding methods for putting into operation, steam and firing engineering section.
Control Specialists:	Electrical and hydraulic section.
Electrical Specialists:	Emphasis on mechanical protection of generators including electrial installations.

Assurance of a sufficiently long period of familiarization for the leading cadres on major building projects and adequate political and professional instruction before delegation to the project is essential.

The domestic circumstances, particularly as regards children of school age, should be given careful attention especially before delegation.